

# Method for Design of Multi-objective Robust Controllers

## Abstract

A method for design of a multi-objective least conservative robust controller to control a plant or a process which may be modeled imperfectly. It comprises a robust analysis step and a robust multi-objective controller synthesis step using Q-parameterization control design technique. In one embodiment of the invention, the K-step of standard D-K iteration for  $\mu$ -synthesis is replaced by a Q-parameterization control design step. The Q-step optimization problem formulation comprises a standard robustness measure and one or a plurality of other performance measures. During the iteration, the Q-step optimization problem formulation can be changed. In another embodiment, a controller satisfying a level of robustness measure is first found. Then, a Q-parameterization control design step is performed, such that one or plurality of the other performance measures are optimized, while still satisfying a level of robustness measure which is the same with, or slightly traded-off from the previous level of robustness measure. In all embodiments of the invention,

if the robustness measure in the Q-step is formulated based on frequency-gridding, the problematic D-step curve fitting process in standard D-K iteration can be avoided. In addition, a least-conservative non-parametric plant uncertainty weights can be incorporated directly without curve-fitting. Therefore the difficulties of curve-fitting and the conservativeness due to curve-fitting in standard D-K iteration can both be eliminated.